Battery Electric Delivery Trucks Project – Emissions Reduction Calculation Attachment

Project Narrative 1 Emissions Reduction Calculation

Proposed project is to replace and deploy battery electric delivery trucks. These electric trucks will be used in lieu of pre-2010 model year diesel trucks for fleets with older diesel replace trucks or post-2010 model year diesel trucks in case of deployment. Due to impact of COVID-19, fleets are facing operational uncertainties and unable to confirm replacement trucks. Therefore, majority of the emissions reduction calculation are based on the deployment scenario. The pre-2010 trucks are subjected to CARB's Truck and Bus Regulation for fleet turn over by 2023.

Table 1: Compliance Schedule by Engine Model Year for Vehicles with a GVWR 26,000 lbs or less

Compliance Date as of January 1	*Existing Engine Model Year*	*Requirements*
2015	1995 & older	2010 model year emission equivalent
2016	1996	
2017	1997	
2018	1998	
2019	1999	
2020	2003 & older	
2021	2004-2006	
2022	N/A	
2023	All engines	

Figure 1 CARB Truck and Bus Regulation Compliance Dates Summary for Medium Duty Vehicles, CARB

Table 1 below show the model year information as well as estimated VMT for each of the fleet confirmed in this project. Choice Lunch and Loomis provided their miles traveled per day, fuel usage, as well as idle time for the annual VMT, fuel consumption and idle hour calculation, an assumption of 261 working days per year was used for calculation. For fleets did not provide this information, default from EPA's Diesel Emissions Quantifier was used.

For the 5 confirmed replacement trucks with model year identified, the MY 2007-2009 trucks are assumed to have 2 years of useful life left. The project life of the electric trucks are assumed to be 10 years. Therefore, after the initial 2 years, the "replacement baseline vehicle" for the 5 replacement trucks are assumed to be 2010 MY Class 6 diesel trucks for the next 8 years of project life. South Coast AQMD staff believe this is the best way to calculate the emissions reduction and not to under estimate the project emissions reduction due to effects of CARB's Truck and Bus Regulation. The life time emissions calculation are straight line calculations of the annual reductions and does not account for deterioration effect. For those fleet who are unable to identify a replacement vehicle, it is assumed that a 2010 MY diesel truck will be used. Note that fleet manager did indicate that it's highly likely that some of older diesel trucks will be replaced once the new trucks arrive, with up to 29 replacement trucks was proposed early 2020 but unable to confirm due to uncertainties related to the COVID-19 situation.

Table 1 Fleet Replacement, Deployments, VMT, Fuel and Idle Summary

Truck Fleet	Industry	Replace-ments	Replacement Models Years	Deploy-ments	VMT	Fuel (gallons)	Idle (hours)
UniFirst	Linen Services			3	[1]1,4962	[1]1,463	[1]30
Choice Lunch	Food Delivery	5	2009 (4) 2007 (1)		19,575	2,175	522
Loomis	Cash-in-Transit			20	23,490	2,936	1,566
ATI	Restoration & Reconstruction			3	[1]1,4962	[1]1,463	[1]30
BLE	Hospitality			29	[1]1,4962	[1]1,463	[1]30
Total		**5**		**55**			

[1] Defaults from EPA Diesel Emissions Quantifier

An EPA Diesel Emission Qualifier (DEQ) output is attached to the end of this document. Note that there are total of 61 vehicle in the DEQ results but third row is a single 2010 MY diesel trucks for Choice Lunch for emissions calculation purposes after the useful life for the current vehicle is ended.

Table 2 below is the emissions reduction summary presented in the project narrative. Note that the replacements and deployment vehicles are presented separately. The deployment trucks lifetime/long term emissions reduction is a simple multiplication of annual reductions as well as the diesel fuel since VMT is assumed to be constant.

Table 2 Anticipated Outputs and Outcomes for Short Term (1st year) and Long Term (over 10 years)

Outputs	Outcomes						
Emissions/Diesel Fuel Reductions (tons/gallons)		**NOx**	**PM 2.5**	**HC**	**CO**	**CO2**	**Diesel Fuel**
Replace 5 MY2007-2009 Class 3-6 diesel trucks with 5 battery electric class 6 trucks	Short term (1st year)	0.399	0.003	0.025	0.091	122	10,875
	Long term (over 10 years)	1.879	0.026	0.159	0.585	1,223	108,750
Deploy 55 battery electric Class 6 trucks	Short term (1st year)	1.491	0.030	0.151	0.550	1,237	109,925
	Long term (over 10 years)	14.914	0.298	1.514	5.496	12,366	1,099,250
Totals (60 trucks)	Short term (1st year)	1.890	0.033	0.176	0.640	1,359	120,800
	Long term (over 10 years)	16.793	0.324	1.673	6.081	13,590	1,208,000

For replacement truck calculations, for the purpose of illustration, an example case of UniFirst replacement trucks (MY 2009 Class 6) and NOx emissions will be presented, a complete list of pollutants and fleets will be attached to the end of this document.

Table 3 Example Emission Reduction Calculation.

Fleet	Veicle Weight Class	Number of Vehicles Retrofitted	MY	Fuel Type	Amount Reduced per Year(NOx , short tons)	Useful Life per CARB Truck & Bus	Total Project Period	Life Time NOx Reduced per CARB Truck & Bus	Life Time NOx Reduced per Baseline	Total Life Time NOx Reduced
Unifirst	Class 6-7	3	2009	ULSD (diesel)	0.1548	2	10	0.3096	0.4392	0.7488
Unifirst Baseline	Class 6-7	1	2010	ULSD (diesel)	0.0183	10	10			

The amount of NOx reduced (0.1548 tons) are directly from EPA's Diesel Emissions Quantifier, since these 3 trucks are model year 2009, there are 2 years of useful life left according to Figure 1 above. Therefore, the life time NOx reduction for are 0.3069 tons. For the remaining 8 years of the project life, the baseline NOx reduction is 0.0183 ton per year per truck or 0.4392 ton for 8 years and 3 trucks. As an result, the total NOx reduction for the three UniFirst replacement trucks is 0.7488 tons. For the actual emissions calculation, UniFirst was not able to confirm the final replaces trucks.

Attachments: Battery Electric Delivery Trucks Detailed Emissions Calculations and Selected Key EPA DEQ Outputs

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Fleet	Class/Equipment	Number of Vehicles Retrofitted	Model Year	Fuel Type	Vehicle Miles Traveled/ Year (VMT)	Unit Cost	Amount Reduced per Year(NOx, short tons)	Amount Reduced per Year(PM2.5, short tons)	Amount Reduced per Year(HC, short tons)	Amount Reduced per Year(CO, short tons)	Amount Reduced per Year(CO2, short tons)	Annuel Fuel	Useful Life per CARB Truck & Bus	Total Project Period		
Choice Lunch	Class 4-5	4	2009	ULSD (dies	19575	$195,000	0.3192	0.0023	0.0198	0.0724	97.875	8700	2	10		
Choice Lunch	Class 3	1	2007	ULSD (dies	19575	$195,000	0.0798	0.0006	0.005	0.0181	24.4687	2175	1	10		
UniFirst	Class 6-7	3	2010	ULSD (dies	14962	$200,000	0.055	0.0009	0.0047	0.0181	49.3763	4389	10	10		
Loomis	Class 6-7	20	2010	ULSD (dies	23490	$150,000	0.8501	0.0197	0.0963	0.3383	660.6	58720	10	10		
ATI	Class 6-7	3	2010	ULSD (dies	14962	$250,000	0.055	0.0009	0.0047	0.0181	49.3763	4389	10	10		
BLE	Class 6-7	29	2010	ULSD (dies	14962	$180,000	0.5313	0.0083	0.0457	0.1751	477.3038	42427	10	10		
Totals		**60**					**1.8904**	**0.0327**	**0.1762**	**0.6401**	**1359**	**120800**				
Choice Lunch Baseline	Class 6-7		2010	ULSD (dies	19575	$195,000	0.0283	0.0005	0.0028	0.0103	24.4687	2175	10	10		

Fleet	Life Time NOx reduction per CARB Truck&Bus	Life Time NOx reduction per baseline	Total NOx Life Time	Life Time PM2.5 reduction per CARB Truck&Bus	Life Time PM2.5 reduction per baseline	Total PM2.5 Life Time	Life Time HC reduction per CARB Truck&Bus	Life Time HC reduction per baseline	Total HC Life Time	Life Time CO reduction per CARB Truck&Bus	Life Time CO reduction per baseline	Total CO Life Time	Life Time CO2 reduction per CARB Truck&Bus	Life Time CO2 reduction per baseline	Total CO2 Life Time	Life Time Fuel
Choice Lunch	0.6384	0.9056	1.544	0.0046	0.016	0.0206	0.0396	0.0896	0.1292	0.1448	0.3296	0.4744	195.75	782.9984	978.7484	87000
Choice Lunch	0.0798	0.2547	0.3345	0.0006	0.0045	0.0051	0.005	0.0252	0.0302	0.0181	0.0927	0.1108	24.4687	220.2183	244.687	21750
UniFirst	0.55		0.55	0.009		0.009	0.047		0.047	0.181		0.181	493.763		493.763	43890
Loomis	8.501		8.501	0.197		0.197	0.963		0.963	3.383		3.383	6606		6606	587200
ATI	0.55		0.55	0.009		0.009	0.047		0.047	0.181		0.181	493.763		493.763	43890
BLE	5.313		5.313	0.083		0.083	0.457		0.457	1.751		1.751	4773.038		4773.038	424270
Totals			**16.7925**			**0.3237**			**1.6734**			**6.0812**			**13590**	**1208000**